Miner & McCarty

Corn Silage as a Factor In Beef Production

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CORN SILAGE AS A FACTOR IN BEEF PRODUCTION

by

Aaron W. Miner and John McCarty

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THIS IS TO CERTIFY THAT THE THESIS PREPARED UNDER MY SUPERVISION BY

Aaron W. Miner and John McCarty

ENTITLED Corn Silage as a Factor in Beef Production

IS APPROVED BY ME AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE DEGREE

OF Bachelor of Science

Herbert W. Mumford

HEAD OF DEPARTMENT OF Animal Husbandry

C O N T E N T S .

CORN SILAGE AS A FACTOR IN BEEF PRODUCTION.

Conditions Suggesting the Thesis.

With the corn-belt farmer, roughage is one of the most important factors in economical beef production. Through the corn growing portion of Illinois, corn stover is a roughage which receives very limited attention by the cattle feeder. The stalks of the corn are often left standing in the field to be dragged down and burned the following spring or to be plowed under. When stover is utilized the entire corn plant is cut up as shock corn, cured in the field and in some instances shredded before feeding. Although a fairly good roughage is secured in this way, cattle do not display the same appetite for shredded fodder as do dairy cows for silage. Experiments conducted at the Ontario Experiment Station show that corn silage is equal in feeding value to roots, the great succulent food used by English stockmen, and for this reason it is deserving of consideration by the American farmer. Since corn silage has come to form an indispensable part of the dairy cows' ration many farmers are desirous of knowing whether or not it can be profitably added to a ration for fattening cattle.

OBJECT

The object of this experiment was to determine the value of corn silage as compared with the ration ordinarily fed by cattle feeders living in the corn belt of Illinois. This ration generally consists of shock corn, clover hay and broken ear corn with oil meal for the last half of the feeding period. The length of the feeding period was to be six months, silage being fed through

the entire period in as large quantities as seemed advisable. An equal acreage of corn, adjoining that put in the silo, was harvested as shock corn so as to determine the relative value of an acre of corn in the form of silage and in the form of shock corn, as a food for fattening cattle.

PLAN.

In making a comparison of feeds one of the features essential to the success of the experiment is to have the animals as uniform as possible in age, quality, condition, breeding and weight. In order to secure uniform animals, the twenty steers selected for this experiment,--the above points being considered,--were taken as an average lot from a bunch of one hundred and thirty-six two year old grade Shorthorns purchased on the Chicago market as choice feeders. The lots in which they were fed had an unshedded brick pavement thirty-six by forty-eight feet and had a twelve foot shed across the north end opening to the south, making the total area of the lot thirty-six by sixty feet. The area beneath the shed was not paved, but each night was bedded with oat straw. Each lot was supplied with water in galvanized tanks from the University plant. A feed trough was placed about the middle of each lot; a manger being fixed along the outside of one for feeding shock corn. These troughs were cleaned each day so as not to allow corn stalks, cobs or waste material to accumulate, thus always giving a fresh palatable feed each time.

Both lots were given a preliminary feeding of seven days, on the feeds to be used in the experiment so as to accustom them to the rations before the experiment proper was started.

The feed was put in the troughs each day at six o'clock in the morning and at half past four in the evening. The steers were weighed every two weeks at six A.M. not having had feed or water since the previous evening. The lot referred to previously as the one receiving the ordinary corn belt ration will be hereafter spoken of as Lot VIII. and the silage lot as Lot I.

Former Investigations.

Few important investigations have been made relating to corn silage as a feed for fattening cattle. In some of the experiments that have been made it has been fed for too short a period to make a fair test. In others, corn silage has constituted a portion of the ration for part of the feeding period but as the first object of the experiment was to test some other feed, little was determined concerning the usefulness of corn silage for fattening cattle. In the majority of experiments that have been made for testing corn silage in beef production, such a small number of steers have been used that individuality could easily enter in to such an extent as to make the experiment of little practical value.

The following bulletins have been selected as representative of the work that has been done by the Experiment Stations in feeding silage to beef cattle. The results of these bulletins are thought to be comparable with Illinois conditions and are taken to show the total and daily gains, the amount of silage fed per day, whether it was fed in connection with nitrogenous concentrates, and the kind and amounts of roughage used.

As to the digestibility of shock corn and corn silage, Professor Henry in "Feeds and Feeding" gives the following results: Fourteen trials with mature dent corn show the shock corn to contain 63% of digestible dry matter; seventeen trials with dent corn as silage show it to have 64% digestible dry matter. Thus the digestibility is about the same in either case. In regard to shock corn and silage Professor Henry says, "We have seen that the losses of nutrients in the two methods of curing are about equal. We have further learned that the digestibility of corn silage and of dry fodder is practically the same. Finally, actual feeding trials with dairy cows have shown that silage usually gives better results than a corresponding amount of dry fodder. The difference in favor of silage is probably due in part to the fact that cattle usually reject the dry butts of the corn stalk, even when cut fine, while in silage this part is readily eaten. Thus with a given amount of forage of either kind, somewhat more of that in the form of silage is consumed. Again, silage is more acceptable to stock than dry fodder, and a larger amount of dry matter is consumed in the same time, which conduces to greater gains in flesh or larger yields of milk. Because the animal willingly eats more food in the shape of silage, there is more nutriment left to form milk or flesh after the wants of the body are met".

ILLINOIS BULLETIN NO.73. In this experiment fifty grade Hereford and grade Shorthorn eight months old calves were used. The calves were divided into two lots and were fed different rations from February 5, to May 5 1902. Lot one received corn silage, oats and mixed hay while Lot II was fed the same ration using

shock corn instead of silage. The following is the daily ration which was fed Feb.3, 1902. Lot I, silage 15 pounds, oats 2 pounds and mixed hay 4 pounds and shock corn 11.5 pounds. March 3, 1902. when the calves were on full feed, a daily ration was as follows:-

	Lot I.	Lot II.
Silage	25 pounds	
Oats	2 "	2 pounds
Hay	4 "	4 "
Shock corn		13.8 "

During the 88 days Lot I. made an average daily gain per steer of 1.63 and Lot II. made only 1.42 pounds. In speaking of the results, the author says in the summary:-

"So far the cost of harvesting and feeding crops for the production of beef is concerned, in the net profits of the enterprise, it should be borne in mind that it will probably require nearly twice as great an expenditure of labor and capital in a system of shock corn feeding". "The silage fed steers were in much better thrift and flesh at the end of the experiment that were the shock corn fed steers".

"In the case of silage fed steers 97.69% of the meat produced was beef and 2.31% pork. In case of t he shock-corn fed steers 84.22% of the meat produced was beef and 15.78% was pork. This clearly shows that pork production is an important factor in a system of feeding shock corn for beef production, while it may be entirely eliminated from a system of silage feeding for beef production, practically without loss".

"It should be noted that the silage fed lot consumed less feed than the shock corn lot and less feed per pound of gain

whether beef alone is considered or beef and pork combined. The amount of dry matter required to produce a pound of gain of meat where the corn was fed in the form of silage was 6.52 pounds; where fed in the form of shock-corn was 8.57 pounds."

MASSACHUSETTS BULLETIN NO.40, issued in July 1891 says of silage:- "The increase in live weight per day when feeding the ensilage fodder ration (I II) to one year old steers has in one instance (Steer 2) exceeded three pounds, while in case of two year old steers it has averaged more than four pounds per day in one case (Steer 4)."

Two yearling steers and two two-year old steers were fed from Dec.17, 1889 to May 9, 1890, but corn silage was fed only from January 4, to February 16. The gains during this period could be expected to be large as steers seem to make the largest gains on silage during the early part of the feeding period as shown by results of North Carolina bulletin 93 and Tenn. Vol XV No.3. During this time the average daily gain for the yearling steers was 2.9 pounds and for the two year olds 3.45 pounds, while for the entire feeding period the average daily gain of the yearlings was 1.60 pounds and for the 2 year olds, 1.20 pounds. At the beginning of the experiment the yearlings averaged in weight 637.5 pounds and the 2 year olds 1207.5 pounds. This experiment was planned to determine the cost of the feed required for beef production under their conditions, each ration being fed for a period of about seven weeks. Hence in this experiment, corn silage was not fed long enough to tell whether or not it could profitably be fed during the finishing period but it did

prove to be a maker of large and economical gains, considering the conditions under which it was fed.

VOL. XV NO.3 OF TENNESSEE STATION, JULY 1902. In this experiment, two of the groups of steers received silage in their ration. The daily ration for a steer in each group was as follows:

	Beginning	Close
Group VI Corn Meal	4 pounds	8 pounds
Cotton Seed meal	2 "	3 "
Sorghum Silage	30 "	46 " (corn silage)
Group VII Corn Meal (1)	5 "	9 "
Cotton Seed Meal (2)	of mixture	
Cowpea Hay	6 pounds	4 "
Corn Silage	30 "	30 "

This bulletin says, "The largest increase per group and the largest gains per individual were made by groups VI and VII, 740 and 836 pounds respectively".

These animals made an individual gain of 2.1 and 1.9 pounds for the entire feeding period of 120 days. "Group VI made their largest gain in the first 30 days period and their second largest gain in the second 30 days period. Group VII made their largest gain, 246 pounds, in the fourth 30 days and their second largest gain, 244 pounds, in the first thirty days period. This bulletin says that a pound of gain with silage costs 5.82 cents and 4.57 cents with the groups VI and VII respectively, and that stover is not as satisfactory a roughage as silage.

NORTH CAROLINA BULLETIN NO. 93. OCT. 1893. Three steers and a heifer were fed silage and cotton seed meal and used in digestion work. They fed eight pounds of corn silage to one of meal, giving about all the mixture the animals would eat. Albuminoids and carbohydrates were digested in the ratio of 1 to 4.9. Steer No. 1 ate 1492 pounds of silage and 160.13 pounds of meal in 32 days and gained 76 pounds. Steer No. 2 ate 1239 pounds silage, 171.13 pounds of meal and gained in 32 days, 85.5 pounds. From this time soy-bean silage was used for about the same length of time and the gains were a little smaller. "With a difference of only .7 pounds in dry matter eaten by steer No. 1 in the two periods there were over 3. pounds more food digested in the ration of carbonaceous course fodder supplemented by nitrogenous bye-fodder, than where nitrogenous bye-fodder was added to a course fodder already rich in digestable nitrogenous compounds." This last method then is wasteful feeding. "Exclusive silage feeding can be practiced with success in growing and fattening stock as well as in maintenance if the ration is made so as to be fed in a properly balanced condition." "Corn silage by itself must still be fed with some other food rich in protein or the corn must be grown with or at least mixed with pea vines or beans, and the two crops cut together for ensilage, which will not require the purchase and addition of bye-fodders."

TEXAS BULLETIN NO. 10, 1890. In this experiment a large number of range cattle were used, forty-six of them receiving silage, the others being fed various feeds. The object of the experiment was to determine the best feed to use with silage and also the best method of feeding cotton seed and its products. "The results

of the two years feeding experiments bear strong evidence as to the superior feeding qualities of cotton seed products and silage over corn and hay for cattle." Shock corn did not give as large gains as did the silage. The hogs following the silage lot receiving ground feed, secured very little feed from the droppings of the cattle. The lot making the best gains contained ten steers averaging at the beginning 671 pounds in weight, which gained 279 pounds in 79 days or 3.53 pounds per day. In contrast with this lot another lot of four steers receiving cotton hulls and cotton seed meal without silage made 2.29 pounds per day for 90 days, the steers weighing 714 pounds each at the beginning of the test. The steers receiving silage were not fed large amounts as their daily ration was as follows:-

Beginning of experiment, Silage 13.21# Hulls 8.09# Cotton meal 3.05#
End of Experiment " 21.1 # " 12.36# " seed " 5.45#

This experiment is certainly the most favorable silage experiment reported, but must be considered with some reserve since the cattle could not be made to gain on this ration after the 79 days.

VIRGINIA BULLETIN NO.10, 1896. Twelve grade Shorthorn steers were divided into six lots, half of them receiving silage as a part of the ration. Owing to the difference in the individuals and the number of rations fed, it is difficult to arrange any figures that would represent the difference, more than to state that the gains were more satisfactory with 37 pounds of silage than with hay, when fed with 12 pounds of corn, 12 pounds of corn meal, and 6 pounds corn meal and 6 pounds bran.

COLORADO BULLETIN NO.34, 1896. Two years feeding experiments with corn silage gave unfavorable results with cattle fed in open

lots. The author of the bulletin explains his results by saying, "that the low temperature and the large amount of heat required to evaporate the water taken in by the silage, are the causes for the small gains." Whether this explanation is the best that can be given, appears doubtful, as several of the figures given are estimated rather than actual weights or measurements.

UTAH, REPT., 1893, pp 11-20. The results given in this report are very unfavorable to silage and give a greater feeding value to shock corn. The author explains his results by stating, "That cattle of the Western states do not relish green food in winter as do cattle in the Eastern states. The cattle receiving silage did not make much growth." The latter is probably due to the cattle being fed nearly exclusively on silage and not given very large amounts, at least they did not consume a large amount. No doubt the same weight of corn fodder and silage when fed to cattle will not produce the same number of pounds of beef, as the silage only contains a little more than a third as much dry matter as the corn fodder. The better way to compare the two feeds is to make a comparison so as to eliminate the water content of the silage, and may be done by using the dry matter as basis, or the amount of beef produced by the two methods of preserving the corn crop.

SUMMARY OF FORMER INVESTIGATIONS

From the results obtained by the various Experiment Stations previously quoted, the evidence seems that silage is a very useful feed in preserving the appetite of the steers. It cannot be relied upon to furnish all the roughage of a ration but may be used as a part. (Col. Bul. 34. Utah Report 1893). To secure the best

results with silage it is necessary to feed some high protein feed as oil meal or gluten, (Mass. Bul. 10, Texas Bul. 10, N.C. Bul. 95) in connection with the grain ration and not advisable to feed an animal entirely upon silage. Most writers agree that steers fed on silage show more thrift and larger gains, (Ill. Bul. 75, Tenn. Vol. XV No. 3.) than do those fed on shock corn, while the beef produced has its content of fat more evenly distributed. The important feature to the Illinois Farmer is that it furnishes a method of farming whereby he can utilize the entire corn crop and at the same time be able to return something to the land. The manure resulting from the feeding of silage to cattle is more easily handled and more convenient to apply to the land than can be secured by feeding the same acreage of corn in the form of shock corn. Again the feeding value of silage does not decrease with age as does shock corn because of weathering and handling, such that the former may be preserved in good condition for feeding throughout the year.

RATIONS AND FEEDS USED.

Lot VIII was fed on shock corn and clover hay from Nov.28 to Jan. 25, when a small amount of ear corn was added to the ration. The shock corn was exhausted Feb.27 and from then to the end of the experiment the cattle were fed broken ear corn, clover hay, and oil meal. The shock corn and hay were fed in the manger fixed for that purpose while the ear corn and oil meal were fed in an ordinary feed trough. Lot I received silage, clover hay, and corn meal throughout the entire time, gluten meal being fed until Feb. 25 when a gradual change was made to oil meal which was completed March sixth. All the feed in this lot was fed in one

large trough five by sixteen feet and ten inches deep, the hay being fed first, the silage next, with the corn meal and gluten or oil meal, being scattered over the top of all. The reason for feeding in this manner was to make it possible to mix the feed so that each steer would get a part of each kind of feed instead of eating only the portion he liked best.

Description of Feeds.

All corn used in this experiment was of the common yellow dent varieties. The ear corn fed was broken in two or three pieces while the corn meal was ground fine. The shock corn consisted of fifty-six per cent ears and forty-four per cent stover. The shock corn was of good quality and it was harvested with a corn binder.

The clover hay was variable in quality ranging from poor to excellent as it was very difficult to secure uniform clover hay. Most of the hay was common red, although a small amount of mammoth clover was fed.

The corn used in making the silage was grown in the same field and adjacent to the shock corn. The silo was filled Sept. 28th, the corn then being in the dough stage with the stover green. The object was to secure as mature corn as possible and at the same time have the stover green. The corn was cut with a Blizzard Ensilage cutter leaving the shredder hooks attached, thus dividing the stalk and ears into very small pieces. In filling the silo the ensilage was tramped well around the walls, no water being applied after filling. The stave silo, ten feet in diameter and twenty feet high, was placed on the brick floor of the feed barn. Three inches of cement was then placed in the bottom of the silo

in order to make it air tight. The silage kept well, the greater part of the waste being taken from the top. About the middle of May the silage began to mold on the surface as a result of the small amount which was being removed each day.

TABLE NUMBER I.

Feeds fed by periods and total amount for whole time.

Feed	Nov.28 to Dec.26	Dec.26 to Jan.23	Jan.23 to Feb.20	Feb.20 to Mar.19	Mar.19 to Apr.16	Apr.16 to May 14	May 14 to June 1	Nov.28 to June 1 Total
Corn Meal 855.5	2222	2785	3197	3932	5462	3760	22213.5	
Silage 7940.5	8400	7890	6430	5580	4345	2405	42800.5	
Clover H.3393.	2340	1745	1680	1710	1680	1070	13628.	
Gluten ML1381.	896	896	360.18				2833.18	
Oil Meal			510.82	840		555	2745.82	
Lot VIII								
Ear Corn		1228	6052.	6446	6979	4625	25330.	
Corn Fodder 6885.	9455	10005	1100				27445.	
Clover Hay 3359	2160	1785	1780	1710	1680	1070	13544.	
Oil Meal			499	840	840	555	2734.	

NOTES ON TABLE I.

Table I shows the different amounts of feeds consumed during each 28 days period by each lot. The figures show that the cattle were fed a liberal amount of silage at the start, the largest being thirty pounds per day for each steer, fed during second period, with a gradual decrease from that to the end of the experiment, when only fifteen pounds were given each day to a steer. When silage is fed in large quantities, the steers cannot be fed enough concentrates to make them fatten; at the same time the large quantity of silage in the ration is likely to produce a paunchy animal which is undesirable from a market stand point. Again silage is a laxative feed and bearing the above facts in mind, it was thought best to decrease the amount of silage, in order to secure the finish which the market demands. The largest amount of hay was fed during the first period, but was decreased as the grain part of the ration was increased, but remained about constant after the third period. The small amount of shock corn fed during the fourth period represents the shockcorn fed while making the change to ear corn and oil meal. The ear corn and corn meal were increased gradually from the beginning as shown by the amounts fed.

TABLE NUMBER II.

Pounds of Dry Matter fed to Lot I each period.

Feed	Nov. 28 to Dec. 26	Dec. 26 to Jan. 23	Jan. 23 to Feb. 20	Feb. 20 to Mar. 19
Corn Meal	762.2505#	1979.7020#	2481.4350#	2848.5270#
Silage	1659.5645	1755.6000	1649.0100	1343.8700
Clover Hay	2873.8710	1990.4500	1478.0150	1422.9600
Gluten Meal	625.1580	822.5280	822.5280	330.6452
Oil Meal O.P.				463.8246
Total	5920.8440	6548.2800	6430.9880	6409.8268

Feed	Mar. 19 to Apr. 16	Apr. 16 to May 14	May 14 to June 1.	Nov. 28 to June 1.
Corn Meal	3503.4120#	4866.6420#	3350.1600#	19792.1285
Silage	1166.2200	887.2050	502.6450	8964.1145
Clover Hay	1448.3700	1422.9600	906.2900	11542.9160
Gluten Meal				2600.8592
Oil Meal O.P.	762.7000	762.7000	503.9400	2493.1346
Total	6880.7020	7939.5070	5263.0350	45393.1828

TABLE NUMBER II. (continued)

Pounds of Dry Matter fed to Lot VIII each period.

Feed	Nov. 28 to Dec. 26	Dec. 26 to Jan. 23	Jan. 23 to Feb. 20	Feb. 20 to Mar. 19
Ear Corn			894.0095	4410.9276
Shock Corn	3979.530	5464.9900	5782.3900	635.8000
Clover Hay	2845.073	1829.5200	1511.8950	1507.6600
Oil Meal				453.0920
Total	6824.6030	7294.5100	8188.7945	7007.4796

Feed	Mar. 19 to Apr. 16	Apr. 16 to May. 14	May 14 to June 1	Nov. 28 to June 1.
Ear Corn	4698.0897	5086.5604	3370.8755	18460.4629
Shock Corn				15863.2100
Clover Hay	1448.3700	1322.9600	906.2900	11471.7680
Oil Meal	762.7000	762.7000	503.9400	2482.4320
Total	6909.1597	7272.2204	4781.1057	48277.8729

NOTES ON TABLE II.

Table II differs from table I in that amounts of feed are expressed in pounds of dry matter. The figures show that the shock corn lot received more pounds of dry matter while the shock corn was being fed than did the silage lot; but during the last two periods a smaller amount. This is due to the silage lot receiving practically the same amounts of corn, hay and oil meal as the shock corn lot, with the silage fed extra. By comparing the amounts of silage and corn fodder in tables I and II the difference in the water content of the two feeds can be easily seen as the silage contains a little more than one third the dry matter of corn fodder. Because of the large amount of water in silage it is impossible to feed in a given time the same acreage of corn as silage, as can be done when harvested in the form of shock corn. Our results would indicate, as do others also, that it takes a third longer time to feed the silage than it does to feed the same acreage of shock corn.

TABLE NUMBER III.

Weight in Pounds, Total and Daily gains by Periods.

	Nov.28	Dec.26	Jan.23	Feb.20	Mar.19	Apr.16	May.14	June 1
Lot 1	10146#	10670#	11460#	12205#	12675#	13455#	14145#	14600#
Lot 8	10375	10800	11280	11880	12390	12985	13655	14195
Period	Nov.28 to Dec.26	Dec.26 to Jan.23	Jan.23 to Feb.20	Feb.20 to Mar.19	Mar.19 to Apr.16	Apr.16 to May.14	May.14 to June 1	Nov.28 to June 1
Lot 1	524#	790#	745#	470#	780#	690#	455#	4454#
Lot 8	425	480	600	510	595	670	540	3820
Lot 1	1.871#	2.82#	2.66#	1.678#	2.786#	2.464#	2.527#	2.447#
Lot 8	1.518	1.714	2.143	1.82	2.125	2.393	3.000	2.099

TABLE NUMBER IV.

Pounds of Dry Matter for each Pound Gain During each Period.

Lot 1	11.299#	9.288#	8.632#	13.637#	8.821#	11.506#	11.567#	10.169#
Lot 8	16.058	15.197	13.648	13.740	11.612	10.654	8.854	12.638

TABLE NUMBER V.

Cost of each Pound of gain by Periods.

Lot 1	$0.0900	$0.0711	$0.0759	$0.1173	$0.0744	$0.0973	$0.0980	$.0864
Lot 8	0.0850	0.0909	0.0790	0.105	0.0934	0.0966	0.0720	.0876

NOTES ON TABLE III.

Table 3 gives the total and daily gains by periods for each lot. The weight of Nov. 28 is an average of three weighings takne Nov. 27, 28, and 29. The weight of June 1st is established in a similar manner, in order to secure wieght that would represent the exact gain although all weighings were taken under like conditions. This table shows that Lot I. made the largest total gain. The small gains made during the fourth period may be accounted for by the fact that the ration was changed for both lots, the cattle were sprayed twice for lice and the annoyance of workmen cleaning out the lots which, owing to the cold weather had not been cleaned for some time previous. Lot VIII. was sprayed February 6th. and 24th. Lot I. February 24th and March 9th. The spray used was Zenoleum and was applied with an ordinary barrel spraying outfit. The gains of Lot I. are more uniform during the entire feeding period than those of Lot VIII. which made their largest gains during the latter half of the experiment and may be attributed to the more nitrogenous ration fed. The gains for the first two periods are not large because about eight weeks were used in getting the cattle on full feed and the preliminary feeding of seven days prevented any fill being included in the first gains.

NOTES ON TABLE IV.

Table IV shows the pounds of dry matter fed for each pound of gain obtained during each period. During the first and third periods the dry matter for Lot VIII. was much in excess of the other. This is due to the larger percent of dry matter in corn

fodder than silage and also that there was not any waste to the silage in feeding, while the steers in Lot VIII. left the large woody portions of the stocks in their mangers or on the ground. It was therefore impossible to weigh this waste, as the purpose was to feed this lot as would be done by the average farmer, giving the steers just what they would clean up readily, thus the number of pounds of dry matter required to produce a pound gain is larger in Lot VIII. than in Lot I. for the three periods while shock corn was fed. During the remainder of the experiment very little difference occurs, yet figures are in favor of Lot VIII.

NOTES ON TABLE V.

Table V is Table IV expressed in a different form and shows with the price of feeds used that Lot I made more economical gains than did Lot VIII.

TABLE NUMBER VI.

Cost of feed by Periods.

Feed Lot I	Nov.28 to Dec.26	Dec.26 to Jan.23	Jan.23 to Feb.20	Feb.20 to Mar.19	Mar.19 to Apr.16	Apr.16 to May 14	May 14 to June 1	Nov.28 to June 1
Corn Meal	$ 3.46	$16.77	$21.03	$24.14	$29.60	$41.24	$28.39	
Silage	13.90	14.70	13.81	11.25	9.76	7.43	4.21	
Clover Hay	16.97	11.75	8.72	8.40	8.55	8.40	5.35	
Gluten Meal	19.87	12.99	12.99	5.22				
Oil Meal				6.13	10.08	10.08	6.66	
Total	$47.20	$56.21	$56.55	$55.14	$58.08	$67.15	$44.61	$384.75
Lot VIII.								
Ear Corn			7.13	35.13	37.45	40.55	26.87	147.16
Shock Corn	21.86	30.02	31.77	3.49				87.14
Clover Hay	16.80	10.80	8.98	8.90	8.55	8.40	5.35	67.78
Oil Meal				5.99	10.08	10.08	6.66	32.81
Total	$38.66	$40.82	$47.88	$53.54	$56.08	$58.93	$38.88	$334.89

NOTES ON TABLE VI.

Table VI shows the cost of feeds by periods. The price of feed varies with different localities and varies with different seasons in the same locality so that the total amount does not show much so far as dollars and cents are concerned but it is another and better method of comparing the total amounts of feeds used.

The total cost of feed for Lot I is higher than for Lot VIII. This is caused by the extra expense incurred in grinding the corn for Lot I, in feeding them gluten meal during the first part of the experiment and by the extra expense in harvesting the silage. The following is the basis used in computing the prices:

Corn Silage	Per Ton	$ 3.50
Corn Meal	" "	15.10
Gluten Meal	" "	29.00
Oil Meal (C.P.) Pea size	" "	24.00
Broken Ear Corn	" "	11.62
Corn Fodder	" "	6.35
Clover Hay	" "	10.00

COST OF FEEDS.

Corn Silage

In filling the silo, 4.708 acres of corn were used. The same amount in acres was harvested as shock corn from the same field. This corn was checked 3' 6" each way and made 16080 pounds of stover. The ear corn was considered worth 35¢ per bushel in the field or 40¢ per bushel in the crib as 5¢ per bushel would place the corn in the crib or in market. 16080 pounds ear corn at 80 pounds per bushel is 201 bushels.

201 bu. corn at 35¢ per bu.	$70.35
Corn binder at $1.00 per acre	4.71
Twine at 30¢ per acre	1.41
7 Teams hauling at $2.50 per day	8.75
Corn Stover (Value at 50¢ per acre)	2.35
3 men in field at $1.25 per day	1.875
2 men to feed machine at 1.25 per day	1.50
1 helper (unloading)	.625
Engine and engineer at $8.00 per day with 16 H.P. engine	4.00
1/2 ton coal	2.00
2 men in silo at 1.25 per day	1.25
25 tons of silage cost	$98.82

Corn Fodder

Used 4.708 acres of corn same as for silage. Took yield of test plot as in silage which was 50 bushels. All of this corn was of the yellow dent variety.

201 bushels of corn at 35¢ per bushel	$70.35
Corn Stover (Valued at 50¢ per acre)	2.35
Cutting and twine at $1.30 per acre	6.12
3 men to shock at $1.50 per day	3.50
Hauling	7.50
14.19 tons corn fodder cost	$89.82

$89.82 ÷ 14.19 is $6.33 value per ton.

Corn Meal

1 Ton shelled corn at 40¢ per bushel	$14.23
Shelling $.34 per ton $14.23 - 34	13.89

Cost of grinding and shelling here was $1.20 per ton .

$13.89 and $1.20 are $15.00 cost of corn meal per ton.

Broken Ear Corn.

1 Ton ear corn at 40¢ per bushel	$11.42
Breaking at 1 cent per cwt.	.20
Cost of 1 ton broken ear corn	$11.62

Gluten Meal.

Gluten meal from Chicago cost, delivered at Champaign, $29.00 per ton.

Oil Meal

Pea size old process oil meal from Chicago cost delivered at Champaign, $24.00 per ton.

Clover Hay.

The clover hay used was baled and the average cost was $10.00 per ton.

TABLE NUMBER VII.

Shipping Weights and Slaughter Test.

Steers.	Wt. of 10 steers at Champaign 6/1/1904	Wt. of 10 steers at Chicago 6/2/1904	Av. Wt. per steer Chicago. pounds.	Percentage of shrink in shipping.	Pounds shrink per steer.
Lot I.	14630	14240	1424	2.66	42
Lot VIII	14340	13960	1396	2.65	38

Steers	Selling price per cwt.	Wt. of 10 carcasses	Av. Wt. of 10 carcasses	Percentage of car. to live wt.	Per ct. of fat.	Per ct. of hide.
Lot I.	$6.10	8830	883	62.7	8.60	6.13
Lot VIII	6.00	8700	870	62.3	8.98	6.02

NOTES ON TABLE VII.

Table VII. shows the shipping weights and the results of the slaughter test. In preparing the cattle for shipment, three feeds of timothy hay were substituted at the last for the clover hay usually fed. Since only two of these feeds are included in the feeds before the final weights were taken, no account is made in the feed tables of this hay, as it was thought to be of too little difference in value and importance to be considered as effecting the gains or the cost to any noticeable extent.

The small difference in the shrinkage of the two lots is doubtless due to the large amount of water drank and hay eaten by the silage cattle after reaching the Stock Yards at Chicago. One must give the silage lot credit for getting a better fill, for two hours after being put in the pens the cattle had all drank, and eaten their hay and were lying down, chewing their cuds very contentedly. One would have expected a larger shrink on this lot of cattle than occured, as a few of the steers were passing liquid faeces when they reached the railroad station after being driven about a mile and a half from the feed lot. The shrink on Lot VIII was about what could be expected in shipping 120 miles.

The differences resulting from the slaughter test were so small that they do not attract much attention. However all of the carcasses in Lot I were classed in the first grade of export beef by the packer (Schwarzchild & Sulzberger) while one carcass of Lot VIII. was classed in the second grade. The larger per cent of dressed carcasses to live weight and the smaller per cent of fat of Lot I would indicate a larger amount of beef produced instead of tallow.

Again the dressing and grading of the carcasses of the silage steers would suggest that the meat was firm and of good quality and not composed largely of water as is thought by some people. The larger per cent of hide and the smaller amount of fat are indications that the silage cattle deposited more of their fat in the outer or surface tissues rather than surrounding the internal organs, a tendency noticeable in the other lot. Both lots appeared about the same with regard to finish of fattening, Lot I being a little the better and commanding a higher price. Considering the condition of the cattle market so far this year, these cattle sold exceptionally well, as the top of the market the day they were sold was $6.20 per cwt., which was the highest price since January 1904 and was paid for two loads of the 136 steers marketed by the Illinois Experiment Station.

TABLE NUMBER VIII.

Individual Weights and Gains of Lot I.

No. of steer.	Weight Dec.26	Weight Apr.16	Gain in 112 days	Average daily gain.
301	930	1165	235	2.10
302	1050	1345	295	2.63
303	1100	1295	195	1.74
304	995	1215	220	1.96
305	965	1195	230	2.05
306	1215	1525	310	2.77
307	1025	1310	285	2.54
308	1295	1575	280	2.50
309	1150	1495	345	3.08
310	945	1335	390	3.48

No. of steer.	Weight May 28	Gain from Apr.16 to May 28.	Av. daily gain Apr. 16 to May28	Total gain from Dec.26 to May 28	Daily gain Dec.26 to May 28
301	1285	120	2.86	355	2.30
302	1460	115	2.74	410	2.66
303	1385	90	2.14	285	1.85
304	1305	90	2.14	310	2.01
305	1290	95	2.26	325	2.11
306	1660	135	3.21	445	2.88
307	1420	110	2.62	395	2.56
308	1690	115	2.74	395	2.56
309	1625	130	3.09	475	3.08
310	1380	45	1.07	435	2.82

TABLE NUMBER IX.

Individual Weights and Gains of Lot VIII.

No. of steer.	Weight Dec.26	Weight Apr.16	Gain in 112 days	Average daily gain.
386	1275	1550	275	2.46
387	1210	1420	210	1.87
388	1035	1245	210	1.87
389	1115	1360	245	2.19
390	955	1220	165	1.46
391	1060	1245	185	1.65
392	990	1160	170	1.52
393	1145	1420	275	2.45
394	970	1215	245	2.18
395	1045	1250	205	1.83

No. of steer.	Weight May 28	Gain from Apr.16 to May 28.	Av. daily gain Apr. 16 to May28	Total gain from Dec.26 to May 28	Daily gain Dec.26 to May.28
386	1655	105	2.50	380	2.46
387	1530	110	2.62	320	2.07
388	1350	105	2.50	315	2.04
389	1480	120	2.86	365	2.37
390	1225	105	2.50	270	1.75
391	1415	170	4.05	355	2.31
392	1255	95	2.26	265	1.71
393	1510	90	2.14	365	2.37
394	1330	115	2.74	360	2.34
395	1395	145	3.45	350	2.28

NOTES ON TABLES VIII AND IX.

Tables VIII and IX show the individual weights and gains of the steers of both lots. By a careful study of the total and daily gains, one can see that the lots were exceptionally well divided as to the feeding capacity of each steer. A wider range of gains is recorded for the steers of Lot I which must be largely attributed to the efficiency of the feed for producing beef and not to the individuality of the steers, as shown by the gains made in each lot. The cattle in Lot VIII made a more uniform gain than did Lot I, especially so when a comparison is made of the individual gains of the six best steers in Lot VIII when numbers 387, 388, 390 and 392, the four poorest, are excluded as there is only a difference of 30# between the extremes of these six. Nearly the same feature occurs in Lot I if numbers 303, 304, 305 and 301, the four poorest, are left out of the comparison. Thus it is evident that the larger gains in Lot I are not due to the gains of a few exceptional individuals, but to larger gains by each steer as shown by a comparison of the four poorest and the six best steers in each lot.

TABLE NUMBER X.

Financial Statement for Lot I.

To	10 Steers	10146#	at	$ 4.25	per cwt.	$431.21
	11.106 tons	Corn Meal	"	15.10	" ton	167.70
	21.400 "	Silage	"	3.50	" "	74.90
	6.814 "	Clover Hay	"	10.00	" "	68.14
	1.416 "	Gluten meal	"	29.00	" "	41.06
	1.373 T	Oil meal	"	24.00	" "	32.95
	Freight to Chicago from Champaign, commission, yardage, feed and other expenses.					25.00
		Total Expenditures.				$839.96
By	10 Steers	14240# at $6.10 per cwt.				$868.34
	37# Pork	at 4.60 " "				1.70
		Total Receipts				$870.34
		Total Expenditures				839.96
		Gain				$30.38
		Profit per steer				$3.038

TABLE NUMBER XI.

Financial Statement for Lot VIII.

To	10 Steers	10375#	at	$ 4.25	per cwt.	$440.94
	12.665 tons	Ear Corn	"	11.62	" ton	147.18
	13.723 "	Corn Fodder	"	6.35	" "	87.14
	6.772 "	Clover Hay	"	10.00	" "	67.72
	1.367 "	Oil meal O.P.	"	24.00	" "	32.81
	Freight to Chicago from Champaign, commission, yardage, feed and other expenses.					25.00
		Total Expenditures.				$800.78
By	10 Steers	13360# at $6.00 per cwt.				$837.60
	720# Pork	at 4.60 " "				33.12
		Total Receipts				$870.72
		Total Expenditures				800.78
		Gain				$ 69.94
		Profit per steer				$6.994

NOTES ON TABLES X AND XI.

The financial statement (Tables X and XI) shows Lot VIII to have been the more profitable. The large amount of pork produced in Lot VIII accounts for a large portion of this profit but taking the pork out of consideration, Lot VIII is $8.14 ahead. Table V shows that a pound of gain costs practically the same in each lot. Lot VIII however, had the largest initial weight and as a pound of gain for them cost practically the same as for Lot I, and as they did not gain so many pounds, their feed bill is lower. Lot VIII had enough finish to sell within ten cents per cwt. of Lot I. Thus Lot VIII shows over twice the profit per steer.

CONCLUSIONS.

1. The steers receiving silage made an average daily gain of 2.447 pounds, while those fed on shock corn made a gain of 2.099 pounds per day for each steer.

2. Lot VIII required 12.638 pounds of dry matter to produce a pound of gain, against 10.169 pounds required by Lot I, a difference of 2.469 pounds in favor of silage feeding.

3. By feeding silage and ground grain with nitrogenous concentrates, the hog is practically eliminated as a factor in beef production.

4. More pounds of feed can be secured from an acre by preserving the corn crop as silage than can be obtained in the form of shock corn.

5. Silage fed steers keep in better health, having keener appetites and do not become so dull and drowsy as do those fed on shock corn. Silage acts as a laxative, but when carefully fed will not prove objectionable when fed in connection with clover hay and oil meal, both of which are laxative feeds.

6. The cost of a pound gain in Lot I was $0.0864 and in Lot VIII $0.0876.

7. That it costs less to handle shock corn than it does silage in preparation for feeding.

8. Lot VIII made larger gains and put on a quicker finish when fed on ear corn, clover hay and oil meal, which is a narrow ration, than when fed on the wider ration of shock corn and clover

hay. Lot I made a more uniform growth throughout the entire feeding period than did Lot VIII and at the same time securing a finish that commanded 10 cts. per cwt. more on the market.

9. Silage when fed in limited amounts, can be made to produce a prime grade of beef, and the meat produced is not found to be soft or objectionable because of the water which some think it contains.

10. The silage steers deposited their fat more evenly than the other lot, dressing a higher per cent of carcass to live weight. The silage did not produce paunchiness as shown by the per cent of dressed beef, Lot I being 62.7 per cent and Lot VIII, 62.3 per cent.

11. The shock corn cattle shipped better than did the silage cattle, the former shrinking 38 pounds and the latter 42 pounds in shipping a distance of 128 miles.

12. All of the carcasses of Lot I were classed as the best grade of export beef while one in Lot VIII was placed in the second grade.

13. The silage cattle did not show any indication of being unusually effected by the cold winter, even during the extreme low temperature recorded for the month of January.

14. The manure resulting from the feeding of silage to steers is more easily handled and more convenient to apply to the land than that secured from feeding shock corn as the accumulation of the large woody portions of the corn stalk makes a very coarse manure which is difficult to handle.

15. From an economical standpoint the shock corn and ear corn has proven a more profitable ration than silage with the prices used in this experiment.